

Risk of perforation using rigid oesophagoscopy in the distal part of oesophagus

Kasper Wennervaldt & Jacob Melchior

ABSTRACT

INTRODUCTION: Endoscopic examination and treatment of disorders in the oesophagus has been a part of the otolaryngological specialty since the introduction of the rigid endoscope. Today, both flexible and rigid oesophagoscopy (RO) is used to that end. The aim of this study was to evaluate the safety of the RO.

MATERIAL AND METHODS: We conducted a retrospective cohort study of all ROs performed at a head & neck department in a Danish hospital in the 2003-2011-period. Perforation of the oesophageal wall was the primary endpoint. Secondary endpoints included: dental injury, mortality and, in case of a foreign body; location and successful removal.

RESULTS: A total of 483 ROs were performed. Four patients (0.8%) suffered perforation; three during removal of a foreign body in the lower part of the oesophagus and one as part of investigation for cancer. 46.2% of the procedures were performed to remove a foreign body and 32.7% as investigation for cancer. The majority of the foreign bodies were located in the superior part of the oesophagus and the objects were successfully removed in all but one case.

CONCLUSION: Our results are well within the range of previously published material. We recommend that the risk of serious complications is taken into consideration when choosing this modality. Furthermore, we believe that this risk increases in the distal part of the oesophagus and recommend that the use of the RO in this area is reserved as a last resort option.

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Endoscopic examination and treatment of disorders in the oesophagus have formed part of the otolaryngological specialty since the introduction of the rigid endoscope by Kussmaul in 1868. The rigid endoscope enabled direct visualization of the oesophagus and made advanced instrumentation possible. Until the invention of the flexible scope in the mid-1950s, rigid endoscopy was the dominant modality for diagnostics and treatment of pathology of the oesophagus. Today, both types of endoscopies are used with overlapping indications. However, the two methods have distinct advantages related to the procedure needed and the underlying pathology. The primary advantage of rigid oesophagoscopy (RO) is the direct access to the area of interest. The large lumen

allows for the use of a wide variety of instruments, which, in turn, allows for the handling and removal of larger objects under direct visualization. The direct line of instrumentation is helpful when manipulating foreign bodies.

During RO, the lumen of the oesophagus is maintained by the instrument and visualization of narrow segments, the postcricoid area in particular, is made possible. RO can be performed only in general anaesthesia. The most obvious advantage of flexible oesophagoscopy (FO) is superior visualization of the mucosa. The fibre technology allows for picture enhancement and offers multiple connective options such as narrow band imaging and video output. The FO has a far greater range of motion and flexibility and allows the physician to reach much further into the gastrointestinal canal, than does the rigid endoscope. FO can be performed in general or local anaesthesia.

Although both procedures can lead to complications such as pain, mucosal lesions, bleeding, dental injury and perforation with subsequent mediastinitis, it is well documented that the RO carries a greater risk than FO that these complications occur [1-8].

A recent study on oesophageal perforations in Denmark [9] comments on the safety of RO performed by otorhinolaryngologists. The study argues that RO should be minimized because of the experience of oesophageal perforations at a thoracic surgical department. The objective of this study was to evaluate the safety of RO based on the number of performed procedures and the number of complications experienced.

It is outside the scope of this study to perform a direct comparison of the two modalities.

MATERIALS AND METHODS

We conducted a retrospective cohort study of all ROs performed at a Danish Hospital in the Head & Neck Department during the period from January 2003 through December 2011. A patient database was created, using the International Classification of Diseases, 10th Edition (ICD-10) coding including: Rigid oesophagoscopy (with and without biopsy), Removal or treatment of pathological tissue in the oesophagus, Dilatation of stricture, Treatment for Zenker's diverticulum/pharyngeal pouch and Removal of foreign body.

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Department of Otorhinolaryngology, Slagelse Hospital

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FIGURE 1

Age distribution.

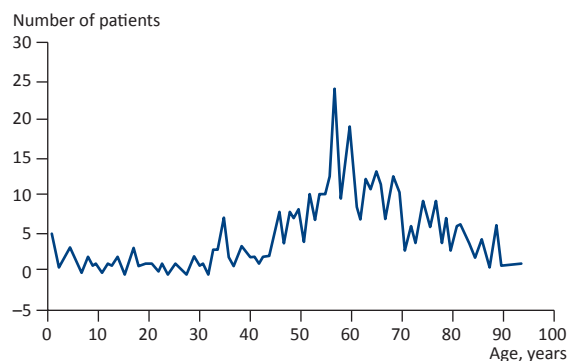
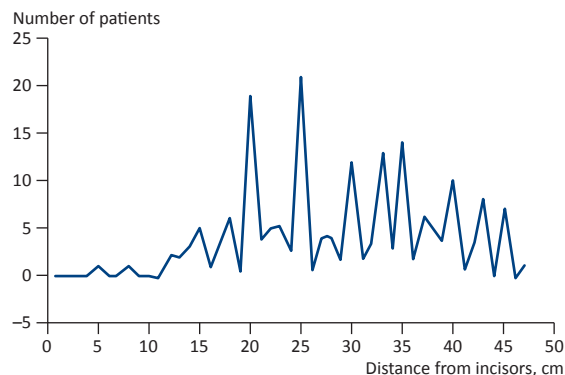


FIGURE 2

Locations of foreign bodies.



Patients only examined with a flexible endoscope were excluded. Patient history was obtained through chart reviews from the point of admittance to 30 days after discharge.

Our primary endpoint was perforation of the oesophageal wall.

Perforation was considered evident when observed during surgery or where subsequent radiological examination (computer tomography or X-ray with the use of water-soluble contrast media) detected perforation or mediastinitis. In case of perforation, a full chart review was performed.

Our secondary endpoints were mortality, dental injury, charge of the operating surgeon and, in case of foreign body (FB), the nature and location of the object as measured in centimetres from the incisors and subsequently the success of the removal. The location of pathology regarding dysphagia and investigation for cancer were not recorded.

All data were obtained with the acceptance of the Danish Data Protection Agency.

Trial registration: not relevant.

RESULTS

A total of 483 rigid oesophagoscopies were performed with a male/female ratio of approximately 2.5:1. See **Figure 1**.

The majority of indications for RO were removal of FB (46.2%) and investigation for cancer (32.7%), the latter often as part of a panendoscopy. The remaining endoscopies were performed as a part of the diagnostic workup on patients suffering from dysphagia (9.9%), in the course of treatment of known pathology (9.9%) or to assess injury after ingestion of corrosive substances (1.2%), **Table 1**.

Primary outcome

We found perforation as a complication to RO in four patients (0.8%), **Table 2**.

In case # 1, RO was performed with the intent to obtain a histological diagnosis of a clearly malignant tumour previously visualized by computed tomography. And in cases # 2-4, the patients underwent RO for removal of a blunt FB at 27, 38 and 43 cm, respectively.

Secondary outcome

The mortality of the procedure was one out of 483 (0.2%) – an 87-year-old female, who died of pneumonia ten days after the procedure. Dental injury occurred in four patients (0.8%).

The procedures were performed by consultants in 295 cases (61.7%), senior residents in 104 cases (22.2%) and by junior residents in 78 cases (16.1%). Of the procedures leading to perforation, a consultant performed two, while a senior resident and a junior resident under supervision performed the remaining two.

The majority of the FB found were blunt (74.4%), while the remaining were either sharp (12.1%) or not described (13.5%). The location of the FB was reported in 188 out of the 223 procedures (84.3%), **Figure 2**. The mean location was 30 cm from the incisors ranging from 5-47 cm. In one case, the FB could not be removed during the oesophagoscopy.

DISCUSSION

The present retrospective study involves 483 ROs performed at a Danish hospital. Perforation was rare, but, unfortunately, caused a fatality in one case. Studies report perforation rates from 0% to 3.2% for rigid oesophagoscopy [1-3, 7, 8, 10, 11] with mortality rates up to 0.25% [12].

There were five separate indications for the 483 ROs, of which the most frequent was removal of FB (223 patients). In this group, we found a male:female ratio of 1.6:1 and a total of three perforations equal to a 1.3% incidence for the individual indication. In one case, the attempt to remove the FB was unsuccessful and we con-

sider this as failures like the three oesophagoscopies causing perforation. Thus, the overall rate of success was 98.2%. The literature reports successful removal rates of 93-99% [7, 10, 11, 13].

The majority were located in the thoracic part of the oesophagus and demonstrated a peak at 20-25 cm from the dental line. This is equivalent to one of the three narrow segments of the oesophagus, namely the passage of the oesophagus behind the aortic arc and the left bronchus. In all three cases of perforation, the FB was located more distally in the oesophagus, which suggests that the risk of perforation increases the more distally the scope advances into the organ.

In our population, only 28 (12.1%) of the removed FBs were sharp and none of those led to perforation. This stands in contrast to a study on complications of oesophagoscopy in which 64.3% of all perforations occurred when a sharp FB was present [5]. Our positive result may be owed to the fact that a rigid endoscope has the ability to protect the oesophageal wall during extraction of a FB. Similar findings were presented in previous publications [6, 7, 14].

The second most frequent indication for RO was investigation for cancer. In this sub-segment, we found a high male:female ratio of more than 6:1. Naturally, this number only reflects the ratio of the patients examined for cancer and not the actual distribution of cancer between the sexes. It does, however, correlate well with the gender spread with regards to incidence of oesophageal and hypopharyngeal cancer [15]. Only in one patient, suffering from a T4 cancer, did we experience perforation. At the time of the procedure, the tumour was transmural in nature and thus already involved the mediastinum.

The treatment of oesophageal stenosis was performed in 22 patients and only when the stenosis was located in the upper part of the organ. A total of 26 patients were treated for Zenker's diverticulum. The perforation risk in these groups is most likely correlated



Rigid oesophagoscopes.

with the invasive nature of the procedure more than with the oesophagoscopy itself. Studies of dilation procedures show perforation rates down to 0.1-0.4% [16]. No complications occurred in either of these groups in our population.

Only six RO were performed to assess corrosive injury and none of those led to perforation.

In all, 21 (0-15 years) of the patients were paediatric (4.3%), but there was no perforation or mortality in this group. One patient was examined under suspicion for cancer and the remaining twenty were performed in order to remove a FB.

Over the eight-year period, the procedure was performed by more than 30 different surgeons. This high number of surgeons involved is due to the length of the period and the hospital's status as a teaching facility. No significant argument about the risk of perforation can be made on the effect of surgeons' charge due to the inherent bias in a non-randomized study.

To fully evaluate the safety of the 483 procedures performed, complications as a consequence of the general anaesthesia should have been recorded. To our knowledge, none of the patients encountered any such complications, but a full review of the anaesthesia charts was not performed.



TABLE 1

Indications and outcome.

Indication	ROs performed, n	Male/female, n	Perforation, n	Incidence, %
Foreign body	223	138/85	3	1.3
Investigation for cancer	158	136/22	1	0.6
Dysphagia	48	21/27	0	0
Zenker's/stenosis	48	39/9	0	0
Corrosion	6	4/2	0	0
Total	483	338/145	4	0.8

RO = rigid oesophagoscopy.



TABLE 2

Details of complications.

Patient #	Indication	Underlying pathology	Location	Surgeon charge	Outcome
1	Cancer	Cancer	Postcricoid	Consultant	Recovered
2	Foreign body	None	27 cm	Resident/consultant	Deceased
3	Foreign body	None	43 cm	Consultant	Recovered
4	Foreign body	Stenosis	38 cm	Resident/consultant	Recovered

Our results are well within the range of previously published material. We find the risk of complications to the procedure to be comparatively low when seen in relation to the inherent risk of a compacted food bolus in the oesophagus or the risk of missing a malignant tumour due to poor visualization. To the head and neck surgeon, rigid endoscopy is essential when assessing the hypopharynx, the postcricoid area and the upper oesophagus. We recommend that the risk of serious complications, at 0.8%, be taken under consideration when choosing this modality. Furthermore, we believe that this risk increases in the distal part of the oesophagus and recommend that the use of the rigid endoscope in this area is reserved as a last resort option.

CONCLUSION

In conclusion, our results do not support a systematic restriction on the use of rigid oesophagoscopy.

CORRESPONDENCE: Kasper Wennervaldt, Vestre Allé 10, 2500 Valby, Denmark. E-mail: wennervaldt@gmail.com

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CONFLICTS OF INTEREST: none

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